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Practical Lubrication for Industrial Facilities

Compiled and Edited by

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Dedication

To the memory of Tom Russo,
Australian Engineer, Inventor, Entrepreneur, Friend.
Those who knew him will always feel the loss.

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Foreword

In 1988, I assisted a Texas-based power generating station in upgrading their lubrication management. Trying to solve component degradation on pulverizer gears required drawing on the decade-long experience of Frank D. Myrick of Summit Oil Company in Tyler, Texas. Frank has since retired, but in the years he served as the president of Summit (now Klüber-Summit, and part of Klüber Lubrication, an international lubricant manufacturing company headquartered in Munich, Germany, with offices in Londonderry/New Hampshire, and Halifax/UK), he often agreed with me on the need for a readable, practical reference text on industrial lubrication.

If anything, this need has become even greater in the intervening decade. Space-age solutions and quick fixes are being pursued. The teaching and understanding of the "non-glamorous" basics is being neglected. Many industrial companies have replaced the job of the lubrication specialist with the multi-task function of the jack-of-all-trades, or the contract employee who was hired on the basis of savings in hourly wages. Regrettably, the procurement of industrial lubricants is rarely scrutinized by a competent reliability professional. Moreover, the task is often tackled without a rigorous technical specification. We have even seen the buying process entrusted to purchasing agents whose only objective was lowest initial cost per gallon, and "as-soon-as-possible" scheduling.

Nevertheless, a handful of "Best-in-Class" industry performers do share a fundamental understanding of lube-related problems and procedures. They are the ones who often perform life cycle cost analyses and, based on the results, will find ample justification to selectively apply superior mineral or synthetic lubricants. They are the profitable, reliability-driven facilities that cherish and promote an understanding of the many interwoven facets of lubricant specification, selection, substitution, application, analysis, replacement, in-situ purification, consolidation, handling and storage.

Which brings me to the scope and purpose of this book. I set out to assemble practical and important lubrication and lubricant topics into a format that satisfies such principal requirements as technical relevance, readability, and applicability to the widely varying needs of modern industrial plants. I tapped into many available resources; these included Klüber Lubrication in Munich/Germany, Royal Purple in Humble/Texas and, especially, the Lube Marketing Department of my old employer, Exxon, in Houston/Texas. These folks know their business and are deserving of my sincere gratitude for allowing me to use so much of their outstanding, commercially available material.

The world's best manufacturers and formulators of lubricants are constantly seeking to improve products to keep pace with the development of higher-speed machinery, or equipment that is run at over 100 percent of name plate capacity, or machines that are being subjected to temperature extremes, extended oil drain intervals, or just plain simple abuse. In short, even as we read these introductory pages, new lubricants are in the process of being developed which will go well beyond the capabilities of today's already exceptional products.

While the principles of lubrication are extremely well understood and will never change, the reader should nevertheless realize that the only constant in this equation is

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change. In other words, we can be certain that by the time this book goes to press, some of the product specifications described in our text will have changed, or even been replaced by another product. However, this should not deter us from using this text as an important reference which will enable the reliability professional, mechanic, machinist, or lubrication specialist to acquire an understanding of what's important in a lubricant. This understanding will enable that person to establish an intelligent discourse with the lube supplier, allowing him or her to ask relevant questions, and separate mere sales talk and often unsupported claims from relevant facts.

Although compiling and editing was greatly facilitated by the cooperation of the three companies whose literature and experience I reviewed in great detail, the book is far from complete. Exxon alone produces numerous grades of waxes, as I'm sure other manufacturers do also. The inclusion of all available selections and options, formulations and gradations would have made the book bulky and expensive, while still not allowing the reader to bypass the all-important contact with the manufacturer's marketing specialist. Moreover, the readability of the text would not necessarily have been improved by attempts to include every one of the literally hundreds of lubrication products available to the sophisticated buyer.

While I had made the decision to limit my coverage to Klüber-Summit, Royal Purple and Exxon, it was certainly not my intention to advertise their products to the exclusion of lubricants offered by worthy competitors. But, let the reader remember the word root of the term "competitor." To be considered as your supplier, a competitor should be able to demonstrate competence. Hopefully, this text will allow you to do some screening for competence. There are many ways to screen suitable lubricants from the ones you may want to avoid, and the material included in this text should facilitate the screening task. For instance, the reader would look at the typical specifications of a premium grade turbine oil that is being offered to his plant by a certain vendor, and compare it against the specifications, or performance characteristics of premium grade turbine oils described in this text. Any deviations would provide the basis for questions and follow-up discourse with suppliers.

Of course, I wanted this text to be useful, helpful and educational in many other ways. For instance, if you wanted to brush up on the basics, start by reading Chapter 1. Take a quick look at Chapter 2, which briefly explains the four lubricant categories and then move on to Chapter 3. It may not be efficient for you to delve into all the detail contained in Chapter 3, but try to get to know its general scope. In it you will find not only the terms that describe lubricants, but the significance of a parameter, or attribute, or property of a lubricant. That's critically important for readers confronted with the task of sifting through the claims and counterclaims of an aggressive salesperson whose entire income is commission-based.

Become familiar also with the attributes and specifications of superior R&O lubricants, discussed in Chapter 4. They cover a wide range of applications and are thus essential for lube oil conservation and consolidation projects. For heavier duty hydraulic oil requirements, read Chapter 5. And if you have need for FG (food-grade) oils, consult Chapter 6. This chapter covers both mineral and synthetic FG lubricants and may, perhaps, shed a different light on our acquired notions and someone's occasional claims about "environmentally friendly" lubricants.

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I trust that Chapter 7 will equip readers to understand the merits of the most important synthetic hydrocarbon oils. It is virtually impossible for a truly forward-looking industrial facility to reach peak maintenance efficiency and optimized reliability performance without the judicious selection and application of synthesized hydrocarbons. Which is why this chapter endeavors to give solid, experience-based guidance and leads into Chapter 8, lubes for severe duty in forest product and paper machinery. This is where the reader will perhaps notice the overlap between lubricants used primarily in wood and paper processing, and lubricants applied in other industries. Of course, a similar overlap exists elsewhere.

Lubricating greases are covered in Chapter 9. Here, too, the objective is not to advertise "product X" from "manufacturer Y", but rather show the widely varying characteristics, application ranges, and inspection parameters found in a competitive market place. The reader/user is urged to compare parameters and ask questions. As is the case with liquid lubricants, lubricating greases must be optimized for the application or service. It is not possible to have a single grease that excels in every conceivable parameter, e.g., lowest cost, best resistance to water washout, high temperature capability, low-frictional torque, compatibility with all elastomers, paints, etc. Lubricant selection involves recognizing tradeoffs; the selection must be optimized.

In Chapter 10, the reader will find material on pastes, waxes, and tribo-systems. Then, Chapter 11 will provide a solid, up-to-date introduction to lubricant delivery systems, including centralized grease and fully automated oil mist lubrication systems used by the most profitable "Best-of-Class" facilities world-wide. The reader will appreciate that Chapter 11 is a logical bridge to Chapter 12, dealing with the various types of bearings found in modem machinery, as well as other machine elements and components that must be lubricated for long-term, satisfactory operation in a bottom-line cost oriented environment.

Electric motor lubrication is dealt with in Chapter 13, while the lubrication of closed and open, large and small gears is given extensive coverage in Chapter 14. The text moves to the subject of compressors and gas engines, highlighting the selection of high performance lubricants for both equipment categories in Chapter 15. A number of illustrations convey the anticipated "clean running" results.

Chapter 16 addresses issues relating to the long-term, cost-effective lubrication of steam and gas turbines. Should special lubricants be used? What should be their typical inspections, or performance parameters? Next, Chapter 17 starts out by discussing lubricant contamination and on-stream lube oil purification or "reconditioning." What equipment should be used, and how effective is oil purification? Then, the chapter deals with the subject of lubricant longevity.

Storage, handling and lubricant consolidation can lead to bottom-line savings and opportunities for improved maintenance efficiency; accordingly, Chapter 18 gives tangible guidelines. Then, the various aspects of oil analysis are given thorough and authoritative treatment in Chapter 19. A comprehensive glossary and many pages of useful appendix material round off this highly practical, totally up-to-date text.

Make sound and productive use of it!

Montgomery, Texas, January 1999
Heinz P. Block

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